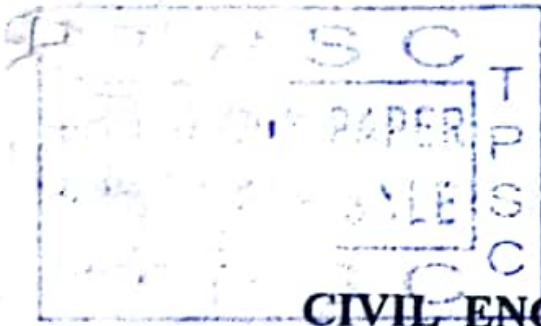




TR/TES/C-IV(B)/13

CIVIL ENGINEERING

Paper : I

Grade : V(B) - Diploma

Full Marks – 200

Time – Three hours

The figures in the margin indicate full marks for the questions.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

Answer *all* the following questions. $6 \times 15 = 90$

Answers to be restricted to 40 words.

1. Define : Shear force and Bending moment.
2. What is efflorescence in bricks ? What are its causes and remedies ?
3. What is water cement ratio and how does it affect the properties of cement concrete ?
4. Define : Initial setting time and Final setting time of cement.

[Turn over

5. What is 'earth pressure at rest'? Derive an equation for determining the magnitude of earth pressure at rest condition.
6. Discuss various functions served by foundations.
7. What do you understand by a 'shallow foundation'? Draw sketches to show various types of shallow foundations.
8. Differentiate between pile foundation and pier foundation.
9. Write chemical composition of Portland cement and also state their functions.
10. What are the essential qualities of a timber suitable for structural use?
11. Distinguish between a preliminary estimate and detailed estimate. Enumerate various methods of preparing estimate.
12. What is bulking of sand? State its practical importance.
13. Define : Column and Strut.
14. What are the various characteristics and uses of first class bricks?
15. What is depreciation? Describe briefly the various methods of working out depreciation.

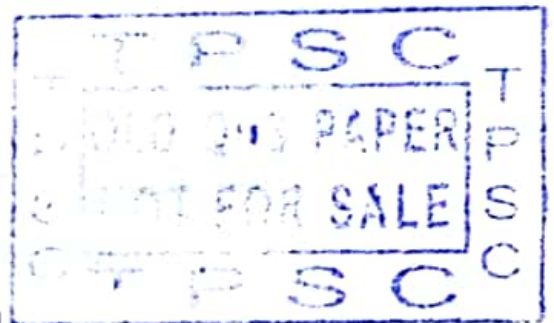
GROUP – B

Answer *all* questions.

Choose the correct answer from the four alternatives provided with each question.

$$2 \times 40 = 80$$

1. The unit of measurement for concrete work in RCC is in
(a) Sq.m (b) Cu.m
(c) 10 sq.m (d) 10 cu.m
2. Granite is mainly composed of
(a) Quartz and mica
(b) Felspar and mica
(c) Quartz and felspar
(d) Quartz, felspar and mica
3. The ratio of the volume of voids to the total volume of given soil mass is called
(a) Porosity
(b) Void ratio
(c) Degree of saturation
(d) Density index



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[Turn over

4. The ratio of plasticity index to flow index is called
- (a) Consistency index
 - (b) Liquidity index
 - (c) Toughness index
 - (d) Shrinkage index
5. Volume of 1 bag of cement weighing 50 kg is
- (a) 3.4 cum
 - (b) 0.034 cum
 - (c) 0.020 cum
 - (d) 1.05 cum
6. Dog legged stairs are
- (a) Straight stair
 - (b) Quarter turn stair
 - (c) Half turn stair
 - (d) Three fourth stair
7. Half turn stairs change their direction through
- (a) 180°
 - (b) 160°
 - (c) 90°
 - (d) 45°

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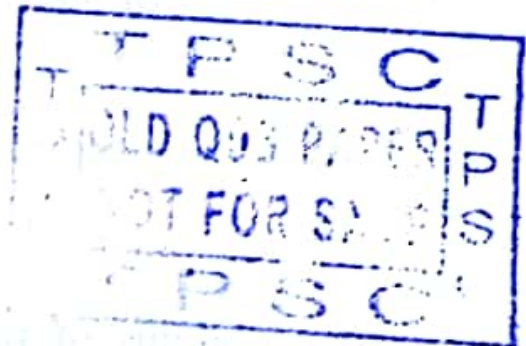
(4)

8. The number of piles required to support a column is

- (a) 1 (b) 2
(c) 3 (d) None of these

9. Floating foundation is a type of

- (a) Well foundation
(b) Raft foundation
(c) Pile foundation
(d) None of these



10. The height of capillary rise is maximum in

- (a) Fine gravel
(b) Colloids
(c) Silt
(d) Fine sand

11. Non-cohesive soil is

- (a) Sand (b) Silt
(c) Clay (d) Clay and Silt

12. Poisson's ratio is

- (a) Linear strain / lateral strain
- (b) Linear strain / linear stress
- (c) Lateral strain / lateral stress
- (d) Lateral strain / linear strain

13. The ratio of stress to volumetric strain is known as

- (a) Bulk modulus
- (b) Young's modulus
- (c) Modulus of rigidity
- (d) None of these

14. The bending moment diagram for a simply supported beam with a point load at its mid-point will be

- (a) A triangle
- (b) A parabola
- (c) A cubic parabola
- (d) A rectangle

15. An imaginary beam for which the load diagram is M/EI , the diagram will be known as

(a) Simply supported beam

(b) Conjugate beam

(c) Laminated beam

(d) Fixed beam



16. Strain energy is given by

(a) $\frac{1}{2} \times \text{stress} \times \text{volume}$

(b) $\frac{1}{2} \times \text{stress} \times \text{strain}$

(c) $\frac{1}{2} \times \text{strain} \times \text{volume}$

(d) $\frac{1}{2} \times \text{stress} \times \text{strain} \times \text{volume}$

17. The unit of torque is

(a) Newton

(b) Newton / metre

(c) Newton / metre²

(d) Newton — metre

18. The shear stress on principal plane is

(a) Maximum

(b) Minimum

(c) Zero

(d) None of these

19. In a simply supported beam having uniformly distributed load (w per unit length) over the whole span (l), the maximum bending moment will be calculated by the formula

(a) $\frac{wl^2}{8}$

(b) $\frac{wl^2}{10}$

(c) $\frac{wl^3}{8}$

(d) $\frac{wl^2}{4}$

20. The point of contraflexure occurs in case of

(a) Cantilevers only

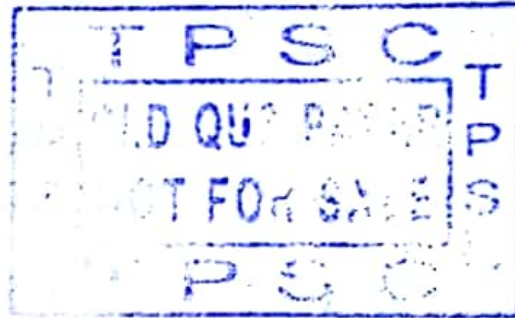
(b) Overhanging beams only

(c) Simply supported beams only

(d) All types of beams

21. The unit of measurement for steel works in trusses and its parts is in

- (a) Cm
- (b) Numbers
- (c) Quintal
- (d) None of these



22. Full form of PERT is

- (a) Programme Evaluation and Road Technique
- (b) Programme Evaluation and Review Technique
- (c) Programme Evaluation and Research Technique
- (d) None of these

23. The bearing capacity of a soil may be improved by

- (a) Reducing the depth of foundation
- (b) Increasing the depth of foundation
- (c) Moistening the soil
- (d) Loosening the soil

24. The active earth pressure of a soil is defined as the lateral pressure exerted by soil

(a) when it is at rest

(b) when the retaining wall has no movement relative to the back fill

(c) when the retaining wall tends to move away from the back fill

(d) when the retaining wall moves into the soil

25. The co-efficient of earth pressure at rest is given by (where μ = Poisson's ratio)

(a) $\frac{\mu}{1 + \mu}$

(b) $\frac{1 + \mu}{\mu}$

(c) $\frac{1 - \mu}{\mu}$

(d) $\frac{\mu}{1 - \mu}$

26. The co-efficient of active earth pressure for granular soils is given by (ϕ = angle of internal friction of soil)

(a) $\frac{1 + \sin \phi}{1 - \sin \phi}$

(b) $\frac{1 - \sin \phi}{1 + \sin \phi}$

(c) $\frac{1 + \cos \phi}{1 - \cos \phi}$

(d) $\frac{1 - \cos \phi}{1 + \cos \phi}$

27. The soundness of cement is tested by
- (a) Air permeability method
 - (b) Le-Chatelier method
 - (c) Vicat's apparatus method
 - (d) All of the above
28. Vicat's apparatus is used to determine the
- (a) Initial setting time of cement
 - (b) Final setting time of cement
 - (c) Normal consistency of cement
 - (d) All of the above
29. Seasoning of timber
- (a) Increases the weight of timber
 - (b) Improves strength properties of timber
 - (c) Decreases strength properties of timber
 - (d) None of these
30. The expansion in Portland cement can be tested by
- (a) Soundness test
 - (b) Fineness test
 - (c) Setting time test
 - (d) Normal consistency test



31. The role of water-cement ratio was established by

- (a) Terzaghi
- (b) W. Simms
- (c) Plowman
- (d) Duff Abram

32. The standard sand now used in India is obtained from

- (a) Mumbai
- (b) Orissa
- (c) Ennore (Chennai)
- (d) Jaipur

33. The bottom diameter, top diameter and height of the slump cone are respectively

- (a) 20 cm, 10 cm, 30 cm
- (b) 30 cm, 20 cm, 40 cm
- (c) 10 cm, 20 cm, 30 cm
- (d) 20 cm, 30 cm, 10 cm

34. Gypsum is added in the manufacture of Portland cement in order to

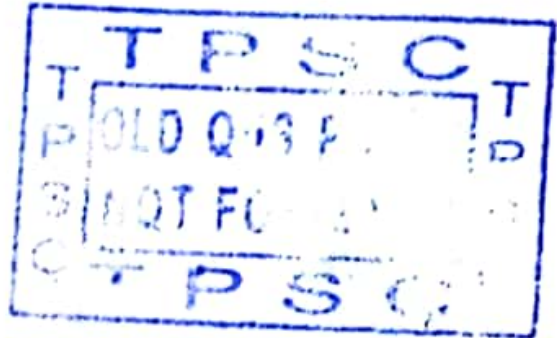
- (a) decrease the grinding time
- (b) lengthen the setting time of cement
- (c) shorten the setting time of cement
- (d) decrease the burning temperature

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(12)

35. The ratio of moment produced at a joint to the moment applied at the other joint, without displaying it, is called

- (a) Carry over factor
- (b) Stiffness factor
- (c) Distribution factor
- (d) None of these



36. The critical gradient of the seepage of water in a soil medium is (G = specific gravity, e = void ratio)

- (a) $\frac{1 - G}{1 + e}$
- (b) $\frac{1 + e}{1 - G}$
- (c) $\frac{1 + e}{G - 1}$
- (d) $\frac{G - 1}{1 + e}$

37. The workability of concrete by slump test is expressed as

- (a) mm/h
- (b) mm²/h
- (c) mm
- (d) hours

38. Casagrande apparatus is used to determine

- (a) Plastic limit
- (b) Liquid limit
- (c) Specific gravity
- (d) All the above

39. The effective size of soil is

(a) D_{10}

(b) D_{20}

(c) D_{30}

(d) D_{40}

40. The unit weight of plain concrete is generally taken as

(a) 20 KN/m^3

(b) 25 KN/m^3

(c) 23 KN/m^3

(d) 24 KN/m^3

GROUP – C

Answer the following questions. $6 \times 5 = 30$

1. A mild steel rod of 20 mm diameter and 300 mm long is enclosed centrally inside a hollow copper tube of external diameter 30 mm and internal diameter 25 mm. The ends of the rod and tube are brazed together, and the composite bar is subjected to an axial pull of 40 kN.

If E for steel and copper is 200 GN/m^2 and 100 GN/m^2 respectively, find the stresses developed in the rod and the tube. Also find the extension of the rod.

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2. At a point in a strained material the principal stresses are 100 N/mm^2 (tensile) and 60 N/mm^2 (compressive). Determine normal stress, shear stress, resultant stress on a plane inclined at 50° to the axis of major principal stress. Also determine the maximum shear stress at that point.
3. A beam 6m long is simply supported at the ends and carries a uniformly distributed load of 1500 kg/m (including its own weight) and three concentrated loads of 1000 kg , 2000 kg and 3000 kg acting respectively at the left quarter, centre point and right quarter point. Draw the shear force and bending moment diagrams and determine the maximum bending moment.
4. A cantilever of length ' l ' carries a point load ' w ' at its free end. It is propped at a distance ' $l/4$ ' from the free end. Find out the prop reaction.
5. Calculate the area of the side slopes of a portion of a bank for a length of 200m , the height of bank at two ends being 2.50m and 3.50m and the side slope $2:1$.

If the side slopes are to be provided with 15 cm thick stone pitching, calculate the cost of pitching at the rate of $\text{Rs. } 1150/\text{m}^3$.